

THELYTOKY IN *SCLERODERMA IMMIGRANS*.

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The Problem.

For some time I have been interested in the presence and absence of wings in the Bethyloid, *Scleroderma*, and the possible mode of hereditary transmission for these conditions. We know that in this form apterous females and alate males are the rule, while winged females and wingless males occur rarely. In these facts we have evidence that the question is related in some fashion to sex determination.

Among the Apidæ and Bombidæ, sex determination appears to be capable of a quite simple explanation. A single complement of chromosomes bearing a certain ratio of male and female producing factors sets up a metabolic developmental rate characteristic of males.

When a double complement is present, as in the fertilized ovum, a new ratio of metabolic tendencies is established and the result is a female.¹

Nachtsheim postulates for the honeybee *Apis mellifica* a sex determination similar to the following:

Results.

$$\text{♀} = 2X + 2A = -4 + 2 = -2$$

$$\text{♂} = X + A = -2 + 1 = -1,$$

where A = autosome set = +1, and

where X = sex chromosome = -2.

The same method of analysis may be applied to other Hymenoptera such as the parasitic form *Microbracon* (*Habrobracon*) *juglandis*, where numerous investigators have found that virgin ♀♀ produce males only.

¹Upon the same theory, by assigning hypothetical weights to sex chromosomes and autosomes, Bridges has been able to account for sex determination in normal *Drosophila melanogaster* as well as the several types of experimentally produced forms bearing aberrant chromosome numbers. Likewise, Goldschmidt account for intersexual forms of *Limantria dispar* produced by interracial crosses.

Sex determination in the Bethyloid, *Scleroderma immigrans*, was formerly thought similar to that of the Apidæ where unfertilized females produce males.

The Material.

My stock of *Scleroderma immigrans* was obtained in Hawaii through the kindness of Dr. Swezey, to whom I am very much indebted.

Having been acquainted with the fact that in Prof. Wheeler's study of the Texan *Scleroderma macrogaster*, he was able to use quite a variety of food material, I expected to employ the larvae of the mediterranean meal moth *Hephestia* of which I had a large stock prepared for *Microbracon* culture.

My *Sclerodermas* refused bark borers and longicorn beetle larva and did well only upon larvæ and pupæ of the pine weevil *Pissodes strobi*. My stock finally perished when the latter food became unavailable.

In the spring of 1928 several vials containing cocoons were received from Dr. Swezey. The parents (which we shall call P₁ generation) were probably born shortly before April 10th, when some of the eggs were laid. They consisted of apterous females and alate males.

The results of my breeding experiments are shown in Table I.

TABLE I.

P ₁	F ₁	F ₂	F ₃	F ₄
winged ♂ ♂	3 winged ♂ ♂	2 winged ♂ ♂	1 winged ♂	1 naked wingless ♀ pupa (from wingless ♀ x wingless ♂)
wingless ♀ ♀	44 wingless ♀ ♀	25 wingless ♀ ♀	1 wingless ♀ 12 wingless ♀ ♀	14 wingless ♀ ♀ (from 3 virgin wingless ♀ ♀ b. Oct. 31) 19 wingless ♀ ♀ from 1 virgin wingless ♀ b. Nov. 1) 1 wingless ♀ (from 3 virgin wingless ♀ ♀ b. Nov. 12; dead in co- coon) 3 wingless ♀ ♀ (from 3 wingless ♀ ♀ x winged ♂) 9 wingless ♀ ♀ pupæ (from 1 virgin wing- less ♀) (cocoons opened Dec. 8)
Hatched before April 10	Hatched May 13	Hatched June 28	Hatched Aug. 4 to Sept. 16	

The first filial generation (F_1) consisted of 3 winged males and 44 wingless females.

The second filial generation (F_2) was composed of 2 winged males and 25 wingless females.

The third generation (F_3) contained 1 winged male, 1 wingless male, and 12 wingless females.

Eight of the 12 wingless females of the F_3 generation were kept virgin, while three females were mated to the winged male. A single female was mated to the wingless male.

In the F_4 from wingless female x wingless male one naked wingless female pupa was produced. It died before maturity.

Three virgin wingless females produced 14 wingless females.

In another vial one virgin wingless female produced 19 wingless females.

Again 3 virgin wingless females produced one wingless female. It died in the cocoon.

The three wingless females mated to the winged male produced 3 wingless females which died in their cocoons.

A wingless virgin female produced 9 wingless female pupæ. These I removed from the cocoons alive.

In all, wingless females x winged males produced 6 winged males, 1 wingless male and 84 wingless females. Wingless females x wingless males gave one wingless female. Virgin wingless females produced 33 wingless females.

Conclusion.

From the fact that virgin females in general produced females, we see that we are dealing with a mode of sex determination differing from the *Apis* type which must be worked out before the question of the inheritance of wings may be comprehensively attacked. Could I have been dealing with a parthenogenetic strain or has change of conditions produced a functional difference in reproductive mode? It is hoped that someone, working where suitable food supply is available the year round, may take up with *Scleroderma* this interesting problem of sex determination and its allied question of wing inheritance.